WHAT IS CLAIMED IS:

1. An isolated nucleic acid encoding a polypeptide comprising the amino acid sequence of SEQ ID NO:45, wherein said polypeptide acts enzymatically as an enoyl reductase and binds a flavin prosthetic group.

2. The isolated nucleic acid of Claim 1 wherein the polypeptide is a bacterial enzyme or an active fragment of the bacterial enzyme.

3. The isolated nucleic acid of Claim 2 wherein the bacterial enzyme has an amino acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:2 comprising a conservative amino acid substitution, SEQ ID NO:4, SEQ ID NO:4 comprising a conservative amino acid substitution, SEQ ID NO:6, SEQ ID NO:6 comprising a conservative amino acid substitution, SEQ ID NO:10, SEQ ID NO:10 comprising a conservative amino acid substitution, SEQ ID NO:12, SEQ ID NO:12 comprising a conservative amino acid substitution, SEQ ID NO:14, SEQ ID NO:14 comprising a conservative amino acid substitution, SEQ ID NO:16, SEQ ID NO:16 comprising a conservative amino acid substitution, SEQ ID NO:18, SEQ ID NO:18 comprising a conservative amino acid substitution, SEQ ID NO:20, and SEQ ID NO:20 comprising a conservative amino acid substitution

4. The isolated nucleic acid of Claim 3 comprising a nucleotide sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:9, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, and SEQ ID NO:19.

5. An isolated nucleic acid that hybridizes under standard hybridization conditions to a cDNA comprising the nucleotide sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:9, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, and SEQ ID NO:19.

6. A recombinant DNA molecule that consists of the isolated nucleic acid of

Claim 1 and a heterologous nucleotide sequence.

7. A recombinant DNA molecule that is operatively linked to an expression control sequence, wherein the recombinant DNA comprises the isolated nucleic acid of Claim 1.

8. An expression vector containing the recombinant DNA of Claim 6.

9. A cell comprising the expression vector of Claim 7.

10. A method of expressing a recombinant polypeptide in the cell of Claim 8 comprising culturing the cell in an appropriate cell culture medium under conditions that provide for expression of the polypeptide by the cell, wherein said recombinant polypeptide comprises the amino acid sequence of SEQ ID NO:45, can bind a flavin prosthetic group and can act enzymatically as an enoyl reductase.

11. The method of Claim 9 further comprising the step of purifying the recombinant polypeptide.

12. The recombinant polypeptide purified by the method of Claim 11.

13. A nucleic acid comprising a polypeptide that has at least 80% identity with a bacterial enzyme comprising an amino acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:18, and SEQ ID NO:20; wherein said polypeptide binds a flavin prosthetic group and has enoyl reductase activity.

14. A nucleic acid comprising a polypeptide that comprises at least 12 consecutive amino acids of a bacterial enzyme that has an amino acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:18, and SEQ ID

NO:20; wherein said polypetide binds a flavin prosthetic group and has enoyl reductase activity.

15. An isolated polypeptide comprising the amino acid sequence of SEQ ID NO:45, wherein said polypeptide acts enzymatically as an enoyl reductase and binds a flavin prosthetic group; and wherein said polypeptide is not a yeast enzyme.

16. The polypeptide of Claim 15 that is a bacterial enzyme or an active fragment of the bacterial enzyme.

17. The bacterial enzyme of Claim 15 that has an amino acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:2 comprising a conservative amino acid substitution, SEQ ID NO:4, SEQ ID NO:4 comprising a conservative amino acid substitution, SEQ ID NO:6, SEQ ID NO:6 comprising a conservative amino acid substitution, SEQ ID NO:10, SEQ ID NO:10 comprising a conservative amino acid substitution, SEQ ID NO:12, SEQ ID NO:12 comprising a conservative amino acid substitution, SEQ ID NO:14, SEQ ID NO:14 comprising a conservative amino acid substitution, SEQ ID NO:16, SEQ ID NO:16 comprising a conservative amino acid substitution, SEQ ID NO:18, SEQ ID NO:18 comprising a conservative amino acid substitution, SEQ ID NO:20, and SEQ ID NO:20 comprising a conservative amino acid substitution.

18. A polypeptide that has at least 80% identity with a bacterial enzyme comprising an amino acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:18, and SEQ ID NO:20; wherein said polypetide binds a flavin prosthetic group and has enoyl reductase activity.

19. A fusion protein comprising the polypeptide of Claim 15.

20. A polypeptide comprising at least 12 consecutive amino acids of a bacterial

enzyme that has an amino acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ IDNO:8, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:18, and SEQ ID NO:20.

21. An antigenic fragment of a bacterial enzyme that has an amino acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:18, and SEQ ID NO:20.

22. A fusion protein comprising the antigenic fragment of Claim 21.

23. An antigenic fragment of a peptide that has an amino acid sequence selected from the group consisting of SEQ ID NO:46 or SEQ ID NO:46 comprising a conservative amino acid substitution.

24. A fusion protein comprising the antigenic fragment of Claim 23.

25. A vaccine comprising the antigenic fragment of Claim 23.

26. An antibody to the antigenic fragment of Claim 23.

27. The antibody of Claim 26 that is a monoclonal antibody.

28. The antibody of Claim 27 that is a chimeric antibody.

29. An immortal cell line that produces a monoclonal antibody of Claim 27.

30. An antibody to the polypeptide of Claim 15.

31. A method for identifying an agent that can modulate the enzymatic activity of an enoyl reductase comprising:

(a) measuring the enzymatic activity of an enoyl reductase or active

fragment thereof in the presence and absence of a compound; wherein said enoyl reductase comprises the amino acid sequence of SEQ ID NO:45 and a flavin prosthetic group, or the amino acid sequence of SEQ ID NO:57; and

(b) identifying the compound as an agent that modulates the enzymatic activity of an enoyl reductase when the enzymatic activity measured in step (a) is different in the presence of the compound relative to in the absence of the compound.

32. The method of Claim 31 wherein the enzymatic activity is lower in the presence of the compound relative to in the absence of the compound, and wherein the compound is identified as an inhibitor.

33. The method of Claim 31 wherein the enoyl reductase has the amino acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:2 comprising a conservative amino acid substitution, SEQ ID NO:4, SEQ ID NO:4 comprising a conservative amino acid substitution, SEQ ID NO:6, SEQ ID NO:6 comprising a conservative amino acid substitution, SEQ ID NO:10, SEQ ID NO:10 comprising a conservative amino acid substitution, SEQ ID NO:12, SEQ ID NO:12 comprising a conservative amino acid substitution, SEQ ID NO:14, SEQ ID NO:14 comprising a conservative amino acid substitution, SEQ ID NO:16, SEQ ID NO:16 comprising a conservative amino acid substitution, SEQ ID NO:18, SEQ ID NO:18 comprising a conservative amino acid substitution, SEQ ID NO:20, SEQ ID NO:20 comprising a conservative amino acid substitution, SEQ ID NO:52, SEQ ID NO:52 comprising a conservative amino acid substitution, SEQ ID NO:54, SEQ ID NO:54 comprising a conservative amino acid substitution, SEQ ID NO:56, SEQ ID NO:56 comprising a conservative amino acid substitution, SEQ ID NO:50, and SEQ ID NO:50 comprising a conservative amino acid substitution.

34. A method for identifying an agent that can bind to an enoyl reductase comprising:

(a) contacting an enoyl reductase or active fragment thereof with a compound; wherein said enoyl reductase comprises the amino acid sequence of SEQ ID NO:45 and a flavin prosthetic group or the amino acid sequence of SEQ ID NO:57;

and

(b) determining if the compound binds to enoyl reductase; wherein a compound is identified as an agent that binds the enoyl reductase when the compound binds to the enoyl reductase.

35. The method of Claim 34 wherein the enoyl reductase has the amino acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:2 comprising a conservative amino acid substitution, SEQ ID NO:4, SEQ ID NO:4 comprising a conservative amino acid substitution, SEQ ID NO:6, SEQ ID NO:6 comprising a conservative amino acid substitution, SEQ ID NO:10, SEQ ID NO:10 comprising a conservative amino acid substitution, SEQ ID NO:12, SEQ ID NO:12 comprising a conservative amino acid substitution, SEQ ID NO:14, SEQ ID NO:14 comprising a conservative amino acid substitution, SEQ ID NO:16, SEQ ID NO:16 comprising a conservative amino acid substitution, SEQ ID NO:18, SEQ ID NO:18 comprising a conservative amino acid substitution, SEQ ID NO:20, SEQ ID NO:20 comprising a conservative amino acid substitution, SEQ ID NO:52, SEQ ID NO:52 comprising a conservative amino acid substitution, SEQ ID NO:54, SEQ ID NO:54 comprising a conservative amino acid substitution, SEQ ID NO:56, SEQ ID NO:56 comprising a conservative amino acid substitution, SEQ ID NO:50, and SEQ ID NO:50 comprising a conservative amino acid substitution.

36. A method for identifying a drug that inhibits bacterial growth comprising:

(a) administering the agent of Claim 31 to a bacterial cell;

(b) determining the growth of the cell; wherein an agent that inhibits the growth of the cell relative to the growth in the absence of the agent is identified as a drug that inhibits bacterial growth.

37. A pharmaceutical composition comprising the drug of Claim 36 and a pharmaceutically acceptable carrier.

38. An isolated nucleic acid encoding a polypeptide comprising the amino acid sequence of SEQ ID NO:57, wherein said polypeptide acts enzymatically as an enoyl

reductase.

39. The isolated nucleic acid of Claim 38 wherein the polypeptide has an amino acid sequence selected from the group consisting of SEQ ID NO:52 and SEQ ID NO:52 comprising a conservative amino acid substitution.

40. An isolated polypeptide comprising the amino acid sequence of SEQ ID NO:57, wherein said polypeptide acts enzymatically as an enoyl reductase.

41. The polypeptide of Claim 40 comprising an amino acid sequence selected from the group consisting of SEQ ID NO:52 and SEQ ID NO:52 comprising a conservative amino acid substitution.

42. A fusion protein comprising the polypeptide of Claim 40.

43. An antigenic fragment of the polypeptide of Claim 41.